Australian Government

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ARTC InlandRail

Inland Rail Programme

Narrabri to North Star Project

Environmental Impact Statement

Technical Report 1: **Traffic, Transport and Access Assessment**

Technical Report 2: **Biodiversity Assessment Report**

Image: Newell Highway north of Narrabri, NSW

Technical Report 1:
Traffic, Transport and Access Assessment

Image: Railway and Newell Highway north of Narrabri, NSW

Australian Rail Track Corporation

Inland Rail - Narrabri to North Star
Traffic, Transport and Access Assessment

October 2017

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Executive summary

This report details an assessment of the traffic, transport and access impacts of the Narrabri to North Star section of Inland Rail ('the proposal').

The proposal would involve upgrading the existing rail line for a distance of 188 kilometres between Narrabri and North Star via Moree, including new crossing loops, track realignment and new sections of rail line, new river crossings, and new overbridges at Jones Avenue and Newell Highway.

Ancillary work would include works to level crossings, signalling and communications, signage, fencing, and services and utilities.

There are 86 existing level crossings that are crossed by the proposal, including 45 of which are on private roads. The preferred approach to level crossings involves a mix of retaining/refurbishing existing crossings, considering the consolidation of some crossings, upgrading the level of control, or installing a gated crossing.

Construction

Construction is estimated to take two years commencing mid 2018 and concluding early 2020. It is anticipated that works would commence north of Moree, then move north of Narrabri in four stages.

For the majority of the construction period, the workforce would average about 180 people, who would be transported to the work site each day by bus or car. Delivery of materials would be made by truck. Total additional activity associated with construction is some 400 vehicle movements per day. A peak hourly volume of 116 vehicles (one-way) is expected.

With this additional traffic, all roads used for construction access, including the Newell Highway, are expected to operate at Level of Service B or better. Localised traffic management would be put in place to manage traffic movement around any works that interact with the road network, including access to construction areas.

Operation

During operation of the proposal minimal traffic generation is expected. Where there is the potential for public roads to be closed, detours are available, and in most situations the number of road users who will be affected is low.

The key traffic impacts of the proposal relate to more frequent train activity at level crossings, although the proposal will allow faster train speeds which will slightly reduce delays associated with individual trains. Traffic activity at most level crossings in the proposal site slow, and the volume of traffic likely to be delayed by train activity is not substantial. There is capacity at each level crossing for delayed traffic to queue clear of adjacent intersections.

At the signalised Alice Street/Moree Bypass intersection the level crossing is incorporated into the traffic signals. While a train passes there may be additional delays experienced for affected traffic, however the signals return to normal function between trains. At the Bullus Drive/Newell Highway intersection, a passing train during the morning peak hour may cause traffic to queue onto the highway, however long turn lanes allow storage for these vehicles to avoid impact to through traffic on the highway.

Recommendations

It is recommended that the following measures be implemented to mitigate the potential traffic, transport and access impacts of the proposal:

- During construction:
  - Preparation of a Construction Traffic Management Plan to guide the interaction of construction activities with the public road network. The Construction Traffic Management Plan should be developed in consultation with Narrabri Shire Council, Gwydir Shire Council, Moree Plains Shire Council and Roads and Maritime Services, and be subject to periodic review and update as agreed between the stakeholders.
- During operation:
  - Provision of signage and other controls at level crossings in accordance with ARTC policy and Australian Standards.
  - Regular review of traffic behaviour and infrastructure at level crossings to confirm that the provided level of protection continues to be appropriate.

1. Introduction

1.1 Overview

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. The Inland Rail programme (Inland Rail) involves the design and construction of a new inland rail connection, about 1,700 kilometre long, between Melbourne and Brisbane. Inland Rail is a transformational rail infrastructure initiative that will enhance Australia's existing national rail network and serve the interstate freight market.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Narrabri to North Star section of Inland Rail ('the proposal'), which consists of 188 kilometres of upgraded rail track and associated facilities.

The proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal is also a controlled action under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment and Energy.

This report has been prepared by GHD Pty Ltd (GHD) as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to accompany the application for approval of the proposal, and addresses the environmental assessment requirements of the Secretary of the Department of Planning and Environment (the SEARs), issued on 8 November 2016.

1.2 The proposal

1.2.1 Location

The proposal is generally located in the existing rail corridor between the town of Narrabri and the village of North Star, via Moree. The location of the proposal is shown in Figure 1.1.

1.2.2 Key Features

The key features of the proposal involve:

- Upgrading the track, track formation, and culverts within the existing rail corridor for a distance of 188 kilometres between Narrabri and North Star.
- Realigning the track where required within the existing rail corridor to conform with required platform clearances for Inland Rail trains.
- Providing five new crossing loops within the existing rail corridor, at Bobbiwaa, Waterloo Creek, Tycannah Creek, Coolleearllee, and Murgo.
- Providing a new section of rail line at Camurra, about 1.6 kilometres long, to bypass the existing hairpin curve ('the Camurra bypass').
- Removing the existing bridges and providing new rail bridges over the Mehi and Gwydir rivers and Croppa Creek.

- Realigning about 1.5 kilometres of the Newell Highway near Bellata, and providing a new road bridge over the existing rail corridor ('the Newell Highway overbridge').
- Providing a new road bridge over the existing rail corridor at Jones Avenue in Moree ('the Jones Avenue overbridge').

The key features of the proposal are shown in Figure 1.2.

Ancillary work would include works to level crossings, signalling and communications, signage and fencing, and services and utilities.

Further information on the proposal is provided in the EIS.

1.2.1 Timing

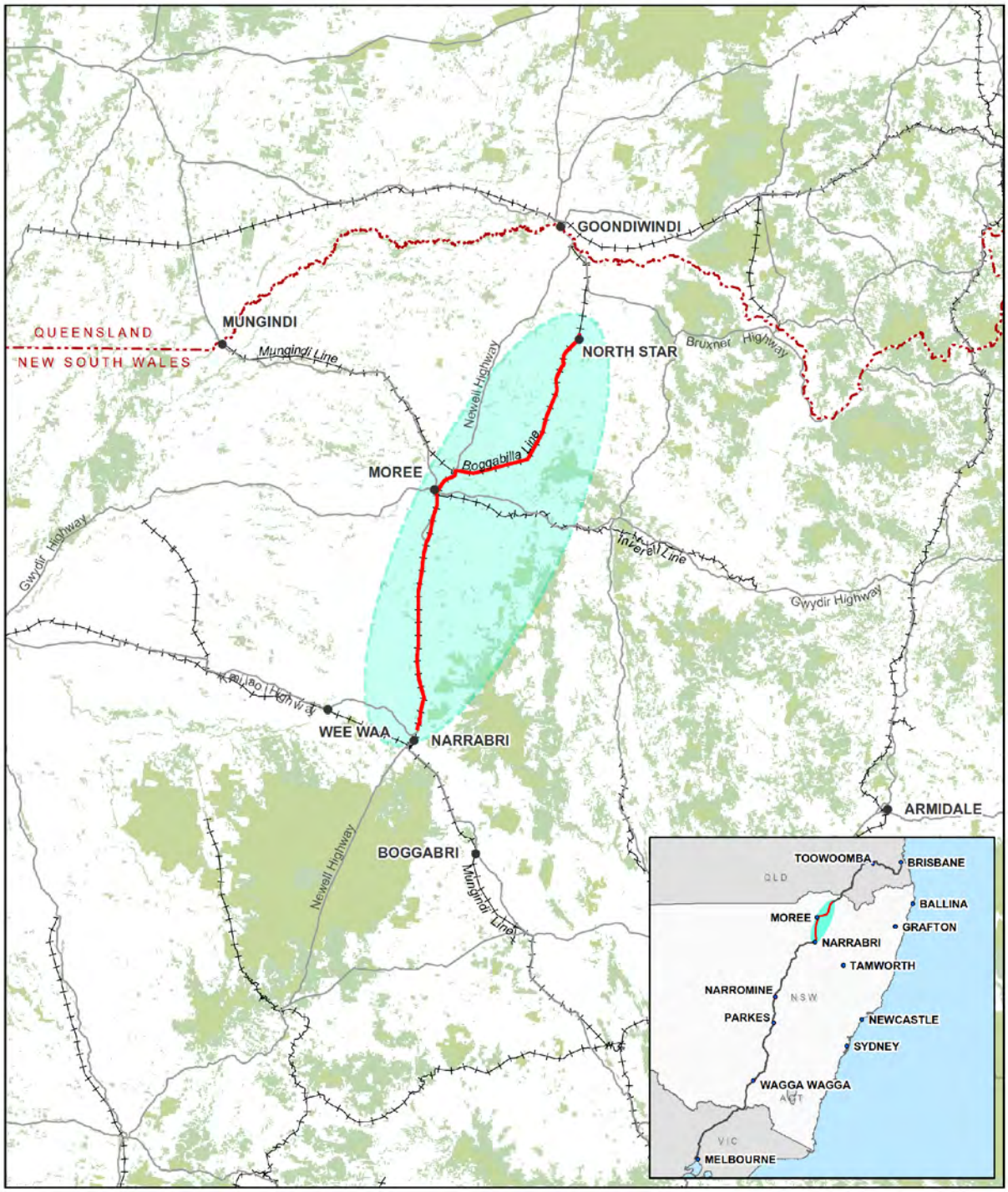
Subject to approval of the proposal, construction is planned to start in early to mid 2018, and is expected to take about 24 months. Existing train operations along the Narrabri to North Star line would continue prior to, during, and following construction. Inland Rail as a whole is expected to be operational in 2025.

1.2.2 Operation

Prior to the opening of Inland Rail as a whole, the proposal would be used by existing rail traffic, which includes trains carrying passengers and grain at an average rate of about four trains per day. It is estimated that the operation of Inland Rail would involve an annual average of about 10 trains per day travelling north of Moree (between North Star and Moree) and 12 trains per day travelling south of Moree (between Moree and Narrabri) in 2025. This would increase to about 19 trains per day north of Moree (between North Star and Moree) and 21 trains per day south of Moree (between Moree and Narrabri) in 2040. The trains would be a mix of grain, intermodal (freight), and other general transport trains.

Once operational in 2020, the proposal would enable increased train running speeds in many areas that are currently the subject of restrictions due to local track conditions. Daily average train volumes are not expected to significantly change until Inland Rail through connection in 2025.

The Mungindi and Inverell lines are existing operational rail lines that join the proposal around Moree. These existing lines will continue to operate following construction of the proposal. Accordingly, only the relevant direct impacts on these existing lines form part of the proposal. Any associated maintenance works and other minor works undertaken by ARTC in accordance with existing ARTC procedures and processes and under relevant State legislative requirements on these existing lines do not form part of the proposal.



LEGEND

Proposal site
Proposal location
Main road
Railway
State border

Paper Size A4

0 10 20 40 60

Kilometers
Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Australian Rail Track Corporation
Inland Rail Track Alignment

Job Number 22-17916
Revision 0
Date 02 Jun 2017

Location of the proposal

Figure 1-1

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

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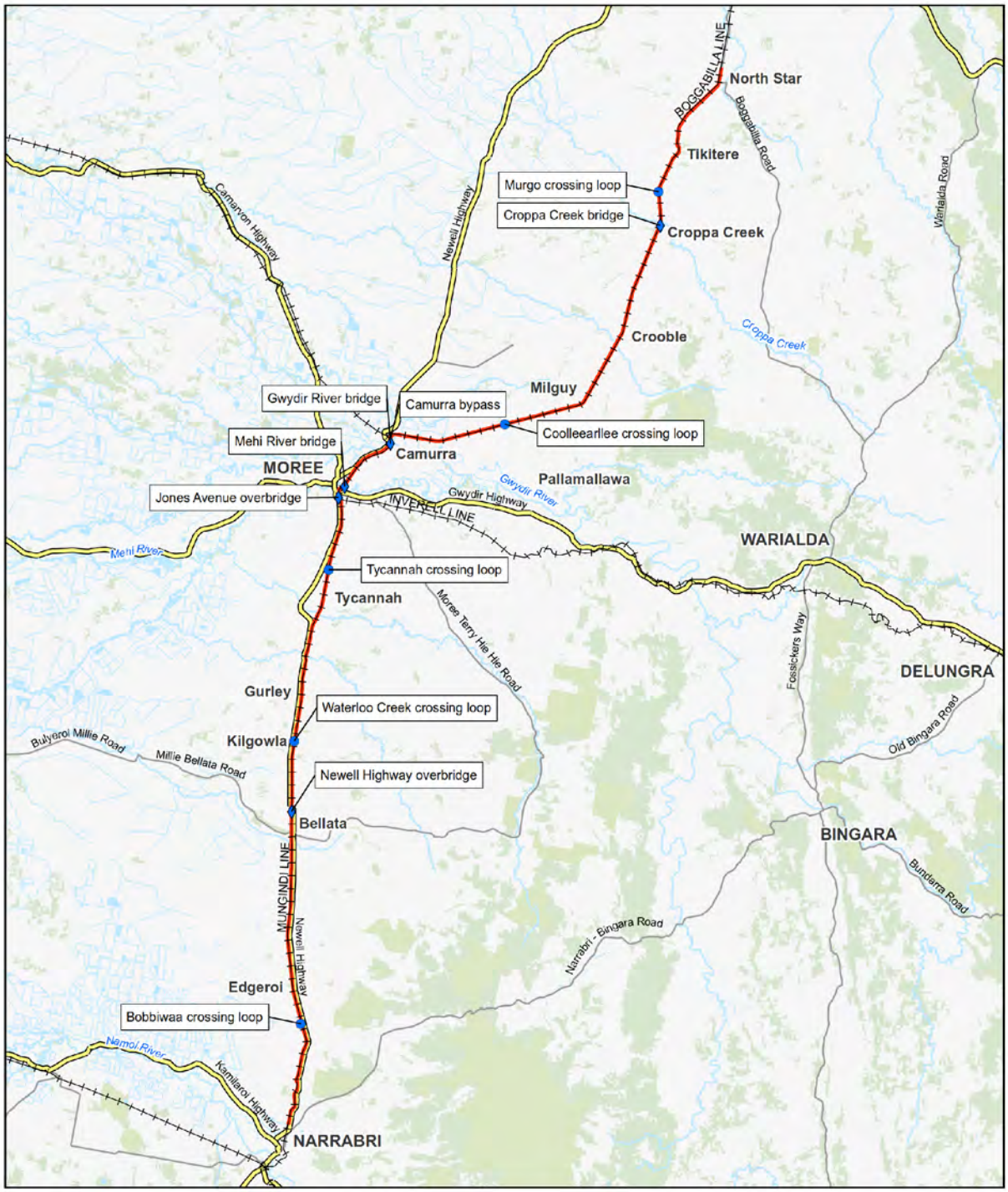
Data source: Commonwealth of Australia (Geoscience Australia), 250K Topographic Data Series 3, 2006. Created by: tmorton, kpsroba



LEGEND

- New bridge
- Crossing loop
- The proposal
- Railway
- Highway
- Road

Paper Size A4

0 3 6 12 18 24

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Australian Rail Track Corportion
Inland Rail Track Alignment

Job Number 22-17916
Revision 0
Date 01 Aug 2017

Key features of the proposal

Figure 1-2

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

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Data source: Commonwealth of Australia (Geoscience Australia), 250K Topographic Data Series 3, 2006. Created by: gmodiarmid, tmorton, kpsroba

1.3 Purpose and scope of this report

The purpose of this report is to assess potential Traffic and Transport issues from the operation and construction of the proposal, and where required, identify feasible and reasonable mitigation measures.

This Traffic and Transport assessment has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs). Table 1.1 outlines the requirements relevant to this assessment.

It also addresses the specific information requested by Roads and Maritime Services, as listed in Table 1.2. This report:

- Describes the existing conditions on the transport network.
- Considers the impact of construct activities by determining the likely traffic generation, access and egress routes and parking requirements in the context of the surrounding road network.
- Determines the delays (total closure time) at level crossings based on the expected train lengths, travel speeds and pre- and post-train closure times.
- Investigates the delay and level of service impacts using calculations and SIDRA modelling.
- Recommends mitigation measure to address any issues identified as part of the assessment.

Table 1.1 Relevant SEARs

Requirements	Where addressed in this report
Traffic and Transport (item 17)	
1. The Proponent must assess construction transport and traffic (vehicle, pedestrian, bus services, train operation and cyclists) impacts, including, but not necessarily limited to:	
a. a considered approach to route identification and scheduling of transport movements.	Section 5.3
b. the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements and track machines).	Section 5.3.2
c. construction worker parking.	Section 5.3.6
d. the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements) and assessment of traffic impacts on these routes including identifying traffic management measures to mitigate any issues.	Section 3, Section 5.3.3, Section 6.2
e. provisions proposed to ensure safe access and egress to/from the classified road network.	Section 5.3.4, Section 5.3.7
f. the nature of any train paths (types and number of movements) and potential impact to these train paths due to additional track possession requirements.	Section 3.2, Section 5.3.5
g. the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the proposal.	Section 5.3.7, Section 5.3.8, Section 5.3.9

Requirements	Where addressed in this report
2. The Proponent must assess (and model) the operational transport impacts of the proposal for both road and rail, including:	
a. Existing and forecast travel demand and traffic volumes for the proposal (road and rail).	Section 5.4.1
b. Travel time analysis (road and rail).	Section 5.4.1
c. Performance of key interchanges and intersections by undertaking a level of service analysis at key locations.	Section 5.4.3
d. Assessment of impacts on the operation of bus services and public transport infrastructure.	Section 5.4.9
e. Wider transport interactions (local and regional roads, cycling, public and freight transport and the broader NSW rail network).	Section 5.4.7
f. Identification of traffic and transport measures to mitigate any impacts.	Section 6.1, Section 6.2.2
3. The proponent must assess the feasibility of level crossings (existing and planned) and take into account:	
a. Safety assessments.	Section 3.5
b. Consistency with any Interface Agreements and related Safety Management Plans, including draft Interface Agreements and draft Safety Management Plans.	Section 3.5
c. Operation of level crossings with regard to road and rail travel speeds, vehicle types, train lengths, train numbers, road and rail traffic volumes and sight distance.	Section 5.4.2
Health and Safety (item 9)	
1. The Proponent must assess the likely risks of the proposal to public safety, paying particular attention to pedestrian safety, subsidence risks, bushfire risks and the handling and use of dangerous goods.	Section 5.3.8, 5.4.8 Non traffic and transport risks assessed in other reports

Table 1.2 Roads and Maritime Services Requirements

Requirements	Where addressed in this report
A traffic impact study prepared in accordance with the methodology set out in Section 2 of the RTA's Guide to Traffic Generating Developments 2002 and including:	
• Hours and days of construction	Section 5.3.2
• Schedule for phasing/staging of the proposal	Section 5.3.2
• Road and rail traffic volumes including: – Existing background traffic – Proposal-related for each stage including construction and operation – Projected future traffic volumes, including background and proposal related	Section 3.3 Section 5.3.2 Section 5.4.3
• Traffic volumes are to also include a description of: – Ratio of light vehicles to heavy vehicles – Peak times for existing road and rail traffic – Peak times for proposal-related road and rail traffic	Section 5.3.2
• The origin, destination and routes for construction traffic including: – Employee and contractor light traffic – Heavy traffic – Oversize and over mass traffic	Section 5.3.1, Section 5.3.4
Details of intermodal hubs required to service the proposal, their locations, uses and projected traffic impacts on the public road network generated by such development.	Section 5.4.1
Details of access requirements and an analysis of affected intersections are to be provided to determine their suitability. In particular, access requirements and locations to/from the classified road network, that is the Newell Highway (HW17), Gwydir Highway (HW12), Bruxner Way (MR462), are to be identified and provisions proposed to ensure safe access and egress.	Section 5.3.4 and Section 5.4.4
A description of all oversize and over mass vehicles and the materials to be transported. The shortest and least trafficked route is to be given priority for the movement of materials and machinery to minimise the risk and impact to other motorists, so far as is reasonably practicable.	Section 5.3.7
The impact of generated traffic and measures employed to ensure efficiency and safety on the public road network during construction and operation of the proposal.	Section 6.2
The level crossing feasibility study is to include a safety assessment for each level crossing. The safety assessment should be consistent with any Interface Agreements and related Safety Management Plans, including draft Interface Agreements and draft Safety Management Plans. Consideration should also be given to the operation of level crossings with regard to road and rail travel speeds, vehicle types, train lengths, road and rail traffic volumes and sight distance.	Section 3.5 Section 4.1 Section 5.4.3 Section 5.4.3
Vibration assessments and studies are to include the impact of construction and rail traffic on nearby road infrastructure including roads, bridges, culverts and road side furnishings.	Refer separate assessment

Requirements	Where addressed in this report
Proposed road facilities, access and intersection treatments, including road-rail interfaces are to be identified and be in accordance with Austroads Guide to Road Design and Roads and Maritime Services supplements.	Section 4 Section 5.4.3 Section 6.2.1
Local climate conditions that may affect road safety for vehicles used during construction and operation of the proposal (e.g. fog, wet weather, etc.).	Section 6.2.1
A Traffic Management Plan is to be developed in consultation with Narrabri, Moree Plains and Gwydir Shire Council and Roads and Maritime Services prior the commencement of haulage and/or construction operations.	Section 6.2.1
Details of existing or required rail encroachments into adjoining road reserves.	Section 5.3.4

1.4 Structure of this report

The report is structured as follows.

- Section 1 – provides an introduction to the report and assessment
- Section 2 – describes the methodology for the assessment
- Section 3 – describes the existing conditions on the road and rail network
- Section 4 – outlines relevant details of the proposal
- Section 5 – outlines the impacts of construction and operation of the proposal
- Section 6 – provides mitigation measures for the impacts identified
- Section 7 – conclusion

2. Assessment approach and methodology

2.1 Methodology

The methodology for undertaking this traffic and transport impact assessment was as follows:

- Review concept design for the proposal.
- Determine the likely traffic generation of the construction activities associated with the proposal.
- Make an assessment of the traffic impacts of construction, including pedestrians, cyclists and public transport.
- Obtain traffic volume data from Moree Plains Shire Council and Roads and Maritime Services for the road network surrounding the proposal site and key level crossings.
- Determine the existing and future delays (total closure time) at level crossings based on train lengths, travel speeds and pre- and post-train closure times:
  - It was assumed that at active crossings the boom gates close 45 seconds prior to a train arriving and open five seconds after the end of train has passed. Actual times vary on a site by site basis, with the assumed values representing a worst-case scenario.
- Use SIDRA Intersection 6.1 to model key level crossings and intersections to determine quantitative level of service impacts of the proposal in operation.
- Assess impacts on travel time of road users due to the proposal.
- Assess impacts on wider transport network, including impacts to cyclists, pedestrians and public transport.
- Determine mitigation measures for any impacts identified in the assessment.

2.2 Legislative and policy context to the assessment

The following documents are referenced in the SEARs for this proposal:

- Guide to Traffic Management – Part 3 Traffic Studies and Analysis (Austroads, 2007)
- Guide to Traffic Generating Developments Version 2.2 (RTA, 2002)
- Cycling Aspects of Austroads Guides (Austroads, 2014)
- NSW Bicycle Guidelines v 1.2 (RTA, 2005)
- Planning Guidelines for Walking and Cycling (DIPNR, 2004)
- NSW Sustainable Design Guidelines Version 3.0 (TfNSW, 2013)
- Central West Regional Transport Plan (TfNSW 2013)
- Western Regional Transport Plan (TfNSW 2013)
- Construction of New Level Crossing Policy (TfNSW)
- NSW Freight and Port Strategy (TfNSW 2013)
- ONRSR Railway Crossing Policy (2016)

2.3 Outcomes sought in relation to traffic and transport

The proposal will provide for more efficient and productive rail operations, while minimising impacts on the operation of the road network around the proposal. This includes managing any short-term impacts during construction, and ongoing issues once the proposal is complete and is operational.

3. Existing environment

3.1 Key roads in the study area

The study area consists of the proposal site and surrounding road network. The road network within the study area consists mainly of local roads and private rural roads. There are two highways within the study area, discussed below.

3.1.1 Newell Highway

The Newell Highway runs generally north-south, and connects between the Goulburn Valley Highway near the Victoria/New South Wales border, and Leichardt Highway near the Queensland/New South Wales border. It forms the primary inland road route between Melbourne and Brisbane, via Narrandera, Parkes, Dubbo and Moree. Within the study area, the Newell Highway runs generally parallel to the rail line. The proposal site crosses the Newell Highway twice, at about three kilometres north of Narrabri Railway Station and four kilometres north of Bellata. At both these locations the rail line passes under the highway.

Outside of built-up areas the Newell Highway has a posted speed limit of 110 kilometres per hour, and generally comprises a single lane of travel in each direction on a single carriageway. Overtaking lanes are provided in some locations.

At Moree, the Moree Bypass provides a limited access route through the eastern areas of Moree urban area. The northern part (stage one) of this bypass, north of the Gwydir Highway, Moree was opened in April 2012 and the southern part (stage two) opened in August 2015. The Moree Bypass has a single lane of through traffic in each direction, with a posted speed limit of 60 kilometres per hour.

3.1.2 Gwydir Highway/Alice Street

The Gwydir Highway runs generally east-west and connects between Castlereagh Highway at Walgett and the Pacific Highway at Grafton. The Gwydir Highway passes through Moree as Alice Street and crosses the rail line at a level crossing. Within Moree, Alice Street has a single lane in each direction with a 50 kilometre per hour speed limit.

3.1.3 Other roads

The Narrabri to North Star rail line crosses a number of local roads, with key roads and their features listed in Table 3.1. Local roads are managed by the relevant local government. State roads and the National Highway are managed by Roads and Maritime Services. Regional roads are managed jointly by Roads and Maritime Services and local government.

Table 3.1 Roads crossed by the proposal[1]

Road Name	Road Management	Surface Type	Shoulders	Line marking
Tarlee Road	Local - Narrabri	Unsealed	No	No
Galathera Lane	Local - Narrabri	Unsealed	No	No
The Clump Road	Local - Narrabri	Unsealed	No	No
Ten Mile Lane	Local - Narrabri	Unsealed	No	No
Millie Road	Local - Narrabri	Sealed	No	No
Penneys Road	Local – Moree Plains	Sealed	No	No
Kanimbla Road	Local – Moree Plains	Unsealed	No	No
Gurley Creek Road	Local – Moree Plains	Sealed	No	No
Bellata Street	Local - Narrabri	Unsealed	No	No
Gurley Settlers Road	Local – Moree Plains	Unsealed	No	No
Tapscott Road	Local – Moree Plains	Sealed	No	Yes
Burrington Road	Local – Moree Plains	Sealed	No	No
Bullus Drive	Regional	Sealed	No	Yes
Jones Avenue	Local – Moree Plains	Sealed	No (some kerb and gutter)	No
Gwydir Highway/Alice Street	State	Sealed	No (kerb and footpath)	Yes
Gwydirfield Road	Local – Moree Plains	Sealed	No	No
Mosquito Creek Road	Local – Moree Plains	Sealed	No	Yes
Roydon Road	Local – Moree Plains	Unsealed	No	No
Wongabindie Road	Local – Moree Plains	Unsealed	No	No
Calimpa Road	Local – Moree Plains	Unsealed	No	No
County Boundary Road	Local – Moree Plains	Sealed	No	No
Alma Lane	Local – Gwydir	Unsealed	No	No
Gil Gil Creek Road	Local – Gwydir	Sealed/Unsealed	No	No
Crooble Road	Local – Gwydir	Unsealed	No	No
Croppa Moree Road	Local – Gwydir	Sealed	No	No
Buckie Road	Local – Gwydir	Sealed	No	No
Tumba Road	Local – Gwydir	Unsealed	No	No
Boonery Park Road	Local – Gwydir	Unsealed	No	No
Croppa Creek Road	Local – Gwydir	Sealed	No	No
I B Bore Road	Local – Gwydir	Sealed	No	No

[1] Excluding private roads and some minor roads

Also relevant to the assessment are a number of roads which run parallel to the rail line, and may be used for construction access. These are listed in Table 3.2.

Table 3.2 Roads parallel to rail line

Road Name	Road Management	Surface Type	Shoulders	Line marking
Newell Highway	National Highway	Sealed	Yes	Yes
North Star Road	Regional	Sealed	No	No
Rail corridor access track	ARTC	Unsealed	No	No

Rail corridor access track

An internal access track used by maintenance vehicles runs along (within) the rail corridor for most of its length in the proposal site. Access to this track is provided off the local road network in a number of locations in the study area. Use of this track is restricted to authorised ARTC maintenance vehicles. The surface is unsealed.

3.2 Existing rail movements

Narrabri and Moree are located on the Mungindi (North West) railway line, which branches from the Main North Line at Werris Creek and heads north west through the towns of Gunnedah and Narrabri to Moree.

North Star is located on the disused Boggabilla line, which branches from the Mungindi line at Camurra (about 10 kilometres north-west of Moree). This line was closed to regular operations in 2013 but is still used occasionally.

3.2.1 Passenger services

Passenger trains operate on the Mungindi line between Werris Creek and Moree, with Moree served by NSW TrainLink's daily Northern Tablelands Xplorer service operating to and from Sydney. In the study area, trains stop at Narrabri, Bellata and Moree. There are no passenger services in the study area north of Moree.

There is currently one Northern Tablelands Xplorer service per day in each direction.

3.2.2 Freight services

Occasional grain/goods trains operate on an as needs basis. Train count data between January 2014 and December 2015 shows an average of 1.8 freight trains per day, with up to seven trains on a peak day. The majority of these services finish at Moree, and the line to North Star is used only occasionally.

Train speeds between Narrabri and Moree are limited to a maximum of 90 to 100 kilometres per hour depending on the axle weight with local speed restrictions due to limitations associated with the existing track. Between Moree and North Star, train speeds are limited to a maximum of 80 kilometres per hour depending on the axle weight.

There are also local speeds restrictions due to existing track condition.

3.3 Existing traffic volumes around the proposal site and on construction access routes

3.3.1 Newell Highway/Moree Bypass

Traffic volumes along the Newell Highway vary within the study area. Roads and Maritime Services counts from 2008 indicate AADT volumes as follows:

- 3,100 vehicles per day just north of Narrabri as shown in Figure 3.1, including:
  - 39 per cent heavy vehicles
  - Peak volumes of around 220 vehicles per hour (two-way) at 9 am and 3 pm, relatively consistent throughout the day
- 2,400 vehicles per day between Bellata and Gurley south of Moree as shown in Figure 3.2, including:
  - 45 per cent heavy vehicles
  - Peak volumes of around 160 vehicles per hour (two-way), relatively consistent throughout the day
- 2,000 vehicles per day between Croppa Moree Road and Buckie Road north of Moree as shown in Figure 3.3, including:
  - 46 per cent heavy vehicles
  - Peak volumes of around 150 vehicles per hour (two-way), relatively consistent throughout the day

SCATS data from the Moree Bypass/Alice Street intersection suggests a daily two-way volume of around 2,600 vehicles per day on the Moree Bypass, with a peak hour volume of up to 200 vehicles.

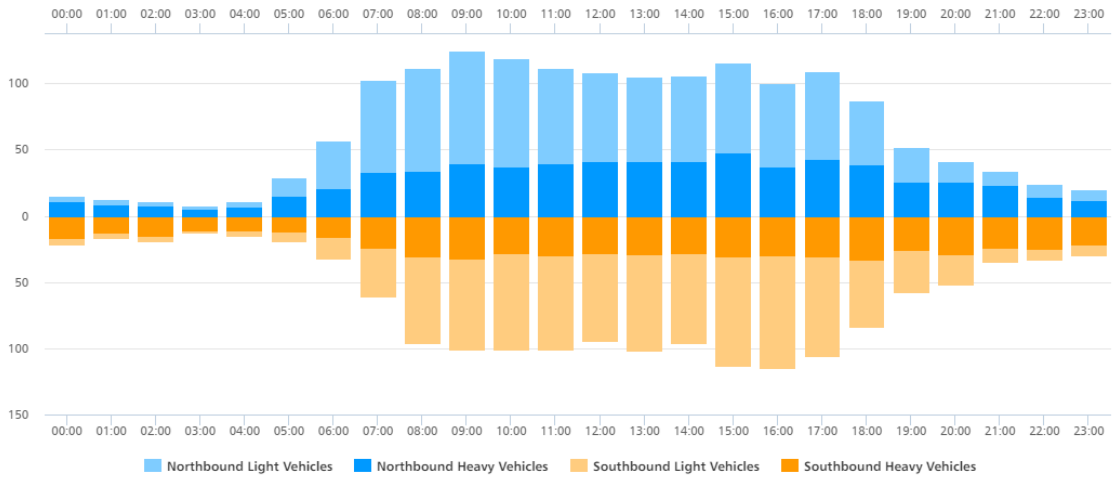

Figure 3.1 Newell Highway daily traffic profile, 2008

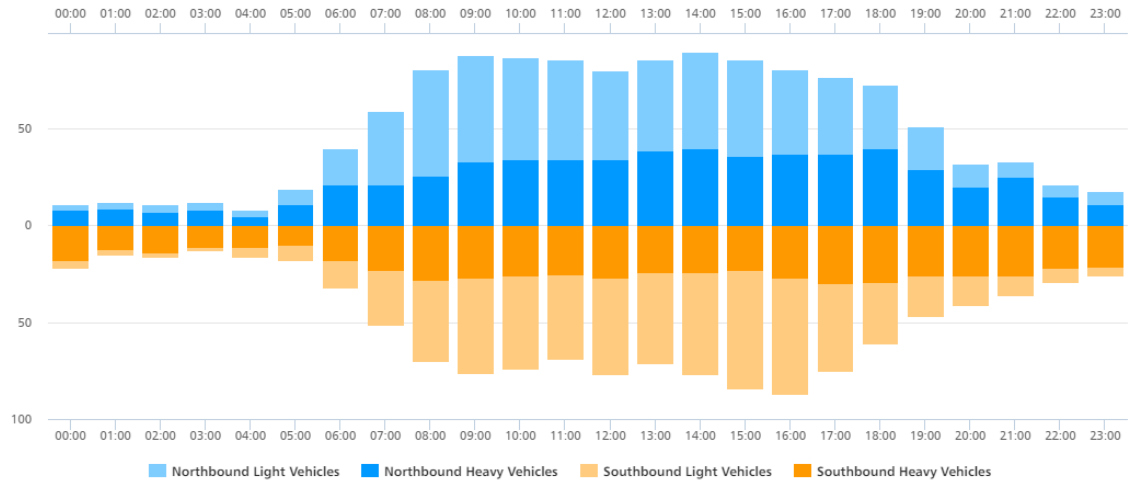

Figure 3.2 Newell Highway daily traffic profile, 2008

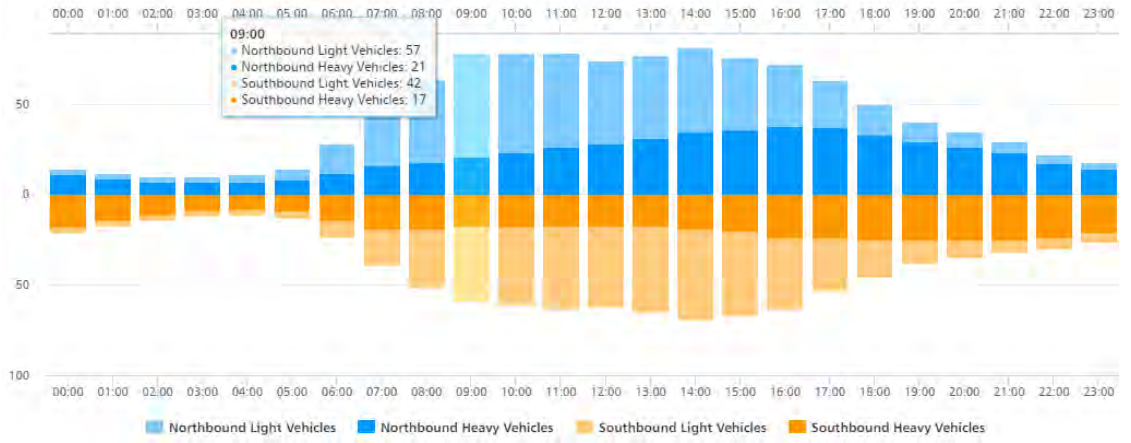

Figure 3.3 Newell Highway daily traffic profile, 2008

3.3.2 Alice Street/Gwydir Highway

Data provided by Moree Plains Shire Council indicates an average weekday volume in Alice Street, west of the Moree Bypass, of 9,000 vehicles. Peak hour volumes are in the order of 350 vehicles in each direction. Westbound traffic experiences a short peak in the morning, while in the afternoon the eastbound peak runs between 3:00 pm and 6:00 pm.

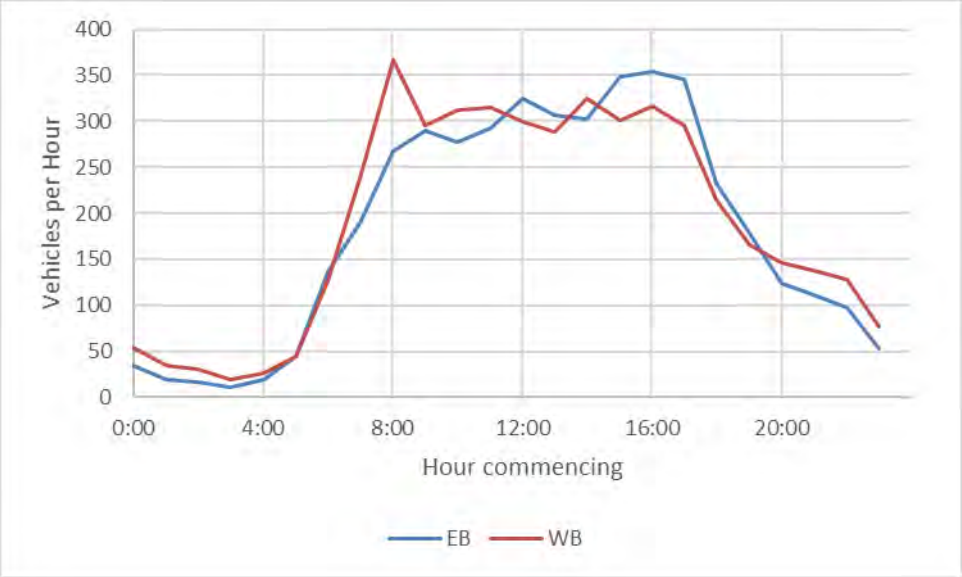

Figure 3.4 Average weekday traffic profile on Alice Street (May 2015)

3.3.3 Bullus Drive

Data provided by Moree Plains Shire Council indicates that in 2013 Bullus Drive had an average daily traffic volume of approximately 2800. Intersection counts taken in 2016 and provided by Council indicate a peak hourly volume of 134 vehicles (westbound) and 103 vehicles (eastbound) in the afternoon peak, with 8 per cent heavy vehicles. Most traffic was surveyed turning right out of Bullus Drive, or left off the Newell Highway, reflecting the dominance of Moree in traffic origins and destinations.

3.3.4 Other roads

Other roads affected by the proposal, including level crossings and potential construction access routes, are generally low volume roads. Traffic volumes for these roads, where available, are listed in Table 3.3.

Table 3.3 Local road volumes (Source: Moree Plains Shire Council)

Road Name	Date of Count	Average Daily Volume (2-way)
Buckie Road	2015	66
Burrington Drive	August 2015	133
Calimpa Road	May 2016	21
County Boundary Road	August 2015	72
Croppa Moree Road	2015	143
Gurley Creek Road	May 2015	41
Gwydirfield Road	December 2015	86
I B Bore Road	unknown	40
Jones Avenue (east of Frome Street)	2013	293
Kanimbla Road	May 2016	18
Millie Road	2015	41
Mosquito Creek Road	2015	164
Penneys Road	May 2016	50

Road Name	Date of Count	Average Daily Volume (2-way)
Tapscott Road	2014	219
Wongabindie Road	May 2016	25

Level of service

A Level of Service assessment was undertaken for the Newell Highway, using the methodology outlined in the Austroads Guide to Traffic Management for two-lane, two-way roads. The busiest section of the Newell Highway is just north of Narrabri, with a peak two-way volume of 220 vehicles per hour and 39 per cent heavy vehicles. At this location the Newell Highway currently operates at Level of Service A. An allowance for growth since 2008 does not alter the calculated Level of Service.

Approximate volume thresholds have been identified for each Level of Service band, for key road types in the study area, as an indication of the volume of traffic each road type is able to accommodate. These are shown in Table 3.4.

Table 3.4 Indicative maximum one-way volumes for Level of Service bands (vehicles/hour)

Level of Service band	Newell Highway	Local roads
Road Description	2-lane, wide sealed shoulders	No centre line, no shoulders
A	250	150
B	500	900
C	900	1450
D	1500	2000

Note that the method of calculating Level of Service is different for local roads than for the other road types. For highway-type roads, Level of Service is determined by a combination of average speed and per cent time spent following (unable to overtake). For local roads, the average speed relative to the free flow speed is the determinant of Level of Service.

Seasonal variation

Based on the dominant rural/agricultural land uses of the study area, traffic volumes on the road network are likely to increase during harvesting season. Harvest of winter crops in the study area can begin in late October and continue through until January in higher rainfall areas (Australian Grain Magazine, July 2016). Key winter crops in the study area include wheat, barley, oats and cereal rye. During this season, heavy vehicle usage on local and main roads in the study area increases as trucks transport grain and tractors and harvesters move between properties. Farming machinery is generally much larger and slower than other vehicles using the roads, and may result in localised delays.

A sensitivity assessment for seasonal variation in potential traffic impacts has been undertaken, detailed in Section 5.3.3.

3.4 Key intersection performance

The proposal site crosses near three intersections, which may be impacted by the proposal and the operation of level crossings. Refer to Section 5.4.2 for details of this assessment.

3.4.1 Alice Street/Moree Bypass

The Alice Street/Moree Bypass intersection is a four leg signalised intersection that incorporates the railway level crossing into the traffic signals. This allows some movements, such as the through movement on the Moree Bypass, to continue while a train is crossing the road. Eastbound traffic from Alice Street, and the turns from the Moree Bypass onto the Gwydir Highway (east), are stopped to allow trains to cross Alice Street.

The performance of this intersection was assessed in SIDRA Intersection 6.1 (SIDRA), using turn movements as surveyed by Council in 2016. Independent of the level crossing being activated, the modelled Level of Service at this intersection is good, with LOS C in both the AM and PM peak periods for 2016 and forecast 2040 traffic volumes.

3.4.2 Bullus Drive/Newell Highway

The Bullus Drive/Newell Highway intersection is give-way controlled, with right and left turn lanes provided for vehicles turning off the highway. Regular and frequent gaps in Newell Highway traffic flow allow traffic to turn into and out of Bullus Drive with generally minimal delay. A SIDRA Intersection 6.1 Model of the 4:00 pm – 5:00 pm peak weekday period, using volumes provided by Moree Plains Shire Council, indicates that the intersection currently operates at Level of Service A, with average delays for all turning vehicles of less than 10 seconds. Due to the priority arrangements, no delays are experienced by Newell Highway traffic.

3.4.3 Burrington Road/Newell Highway

The Burrington Road/Newell Highway intersection is give-way controlled, with a left turn lane provided for vehicles turning off the highway, and a short passing lane provided to allow through traffic on the highway to pass traffic turning right. Regular and frequent gaps in Newell Highway traffic flow allow traffic to turn into and out of Burrington Road with generally minimal delay.

3.4.4 Other intersections

Within the main settlement areas there are a number of intersections located near the proposal site, as listed in Table 3.5. The performance of these intersections was not quantified as part of the assessment, however, as a result of the low traffic volumes, it is expected that there would be little to no delay.

Table 3.5 Key intersections located near the proposal site

Locality	Intersecting road	Intersecting road
Narrabri	Newell Highway	Killarney Gap Road
Edgeroi	Newell Highway	Couradda Road/Tarlee Road
Bellata	Newell Highway	The Clump Road
Bellata	Newell Highway	Berrigal Road
Bellata	Newell Highway	Millie Road
Gurley	Newell Highway	Gurley Creek Road/Moloney Road
Gurley	Newell Highway	Tyrone Road
Moree	Newell Highway	Blueberry Road
Moree	Newell Highway	Tapscott Road
Moree	Moree Bypass	Frome Street
Moree	Moree Bypass	Boggabilla Road

Locality	Intersecting road	Intersecting road
Moree	Newell Highway	Croppa Moree Road
Moree	County Boundary Road	Croppa Moree Road
Camurra	Newell Highway	Mosquito Creek Road
Croppa Creek	Croppa Moree Road	Buckie Road

3.5 Level crossings

3.5.1 Locations

A total of 86 level crossings are located along the proposal site. Of these, 41 are located on public roads (a number of which are Crown roads providing access to a single property), and 45 crossings are located on private roads or maintenance access tracks.

The majority of level crossings along the proposal site have passive forms of control, consisting of give way or stop signs (82 crossings). Other crossings have active controls (either signage with flashing lights, or signage with flashing lights and boom gates).

3.5.2 Delays

The duration of any delay at a level crossing is related to factors including the train length (up to the 1,800 metre maximum length currently allowed on the line) and the train speed. At active crossings, ARTC Engineering (Signalling) Standard ESD-03-01 requires a minimum pre-train warning time of 30 seconds, and a minimum 3 seconds once the train has passed.

The current delays experienced at two level crossings in Moree was assessed based on a maximum train length of 1,800 metres and a conservative assumption of 45 second pre-train warning time and five seconds post-train. These are shown in Table 3.6. The delay at other level crossings would depend on the speed and the level crossing protection level.

Table 3.6 Level crossing delay

Crossing location	Train speed (km/hr)	Delay (seconds)
Alice Street	70	143
Bullus Drive	90	122

3.6 Parking

There is no formal parking provided around the proposal site, with the exception of some on-street parking on Alice Street just east of the level crossing.

Rest areas are provided at various locations along the Newell Highway. Between Narrabri and Camurra, there are four rest areas designated for heavy and light vehicles, and a further four suitable for light vehicles only.

There are three passenger train stations along the proposal site (Narrabri, Bellata and Moree) which have formal parking areas.

3.7 Public transport

In addition to the passenger train services listed in Section 3.2.1, there are some buses that operate within the study area.

A regional coach service travels between Moree and Grafton along the Gwydir Highway, with connections to Tenterfield, Armidale and Tamworth.

Moree has a local bus service which provides routes around Moree, including along Alice Street across the proposal site.

School services also operate on various routes across the study area, including:

- Croppa Moree Road
- County Boundary Road
- Gwydir Highway/Alice Street
- Gurley Creek Road
- Tarlee Road
- Millie Road
- Buckie Road

3.8 Pedestrians and cyclists

Pedestrian and cyclist activity is minimal adjacent to the proposal, with no facilities for pedestrians or cyclists provided along the Newell Highway (outside of Moree) and Moree Bypass, although cycling is catered for on road shoulders. Pedestrian crossings of the Moree Bypass and adjacent rail line are provided at Alice Street and at Moree Station.

Pedestrian paths are provided along both sides of Alice Street.

3.9 Road safety

The 5-year crash history (2009-2013) for the various roads in the study area was obtained from the Transport for NSW Centre for Road Safety. This is summarised in Table 3.7.

Table 3.7 Crash history 2009-2013

Street Name	Fatal	Serious	Moderate	Minor	**Total**
Newell Highway[2]					
Narrabri - Bellata	0	7	2	7	**16**
Bellata – Moree	0	4	7	3	**14**
Moree – Camurra	1	3	2	0	**6**
Camurra – North Star (I B Bore Rd)	3	9	7	10	**29**
Newell Highway total	*4*	*23*	*18*	*20*	***65***
Jones Avenue	0	1	0	0	**1**
Alice Street	0	0	2	1	**3**
Gwydir Highway	0	1	0	0	**1**
Millie Road	0	1	0	0	**1**
Mosquito Creek Road	0	1	0	0	**1**
Croppa Moree Road	0	1	0	1	**2**

The most crashes occurred on the Newell Highway, which is to be expected given the higher volumes of traffic compared to other roads, and length of road considered in this assessment. The high proportion of serious and moderate injury crashes is also noted, most likely a factor of higher vehicle speeds on rural roads.

[2] Data from the highway within Moree was not included as the Moree Bypass was not yet constructed, and crash trends will have changed significantly since the Bypass was opened in 2015.

4. The proposal

The proposal is generally located in the existing rail corridor between the town of Narrabri and the village of North Star, via Moree (as shown in Figure 1.1).

The proposal would involve upgrading the existing rail line between Narrabri and North Star, including:

- Upgrading the track, track formation, culverts and underbridges within the existing rail corridor, for a distance of 188 kilometres, between Narrabri and North Star via Moree.
- Realigning the track where required within the existing rail corridor to conform with required platform clearances for Inland Rail trains.
- Providing five new crossing loops within the existing rail corridor, at Bobbiwaa, Waterloo Creek, Tycannah Creek, Coolleearllee, and Murgo.
- Providing a new section of rail line at Camurra, about 1.6 kilometres long, to bypass the existing hairpin curve.
- Removing the existing bridges and providing new rail bridges over the Mehi and Gwydir rivers and Croppa Creek.
- Realigning about 1.5 kilometres of the Newell Highway near Bellata, and providing a new road bridge over the existing rail corridor.
- Providing a new road bridge over the existing rail corridor at Jones Avenue in Moree.

The following ancillary works would also be undertaken:

- Upgrading, closing or consolidating level crossings
- Upgrading signalling and communications
- Establishing new fencing or upgrading existing fencing along the rail corridor
- Relocating/protecting serwvices and utilities

4.1 Level crossing upgrades

There are 86 existing level crossings, which are crossed by the proposal, including 45 of which are on private roads. The preferred approach to level crossings consists of a mix of retaining, upgrading and investigating the potential consolidation of level crossings, as summarised in Table 4.1. Upgrades of the type of protection to boom barrier controls has been proposed at 10 public crossings. Eight level crossings, primarily on private roads, have been identified as requiring further investigation in relation to crossing consolidation. The public roads which have been identified as consolidation candidates look more like private crossings from a use perspective. Any crossing consolidation will not be finalised unless there is a legal alternative means of access and the local Council, Roads and Maritime Services or landowner (in the case of a private crossing) have consented to the proposed consolidation.

Table 4.1 Summary of preferred option for existing level crossings

Action	Number of crossings affected		
	Public	Private	Total
Consider crossing consolidation based on the outcomes of further investigation and stakeholder endorsement	2	6	8
Upgrade crossing from existing passive protection (give way sign) to Stop sign	3	0	3
Retain existing passive protection (stop sign)	19	26	45
Upgrade from passive to active pedestrian level crossing	3	0	3
Retain existing active protection (railway crossing flashing signal and boom)	4	0	4
Upgrade from give way sign to flashing lights and boom barriers	3	0	3
Upgrade from stop signs to flashing lights and boom barriers	7	0	7
Gated crossing with administrative controls such as the requirement to phone train control prior to use	0	13	13
Total	**41**	**45**	**86**

4.2 Newell Highway overbridge

The existing Newell Highway grade separated crossing at approximate ARTC chainage 620 kilometres currently does not have enough clearance to allow passage of the “F Plate” clearance envelope. An upgrade to this crossing has been proposed to increase the height by about 2.5 metres.

The new overbridge will be constructed alongside the existing structure, and will provide almost identical functionality for road users in terms of connectivity and road movement.

4.3 Jones Avenue overbridge

It is proposed that a grade separated crossing of the rail line be provided in Moree to improve connectivity between each side of the rail line as train activity increases. This is particularly important for emergency vehicles or in the event of a train breakdown. It will be increasingly likely that with Inland Rail in operation, both the Alice Street and Bullus Drive level crossings could be shut simultaneously.

The proposed design is an overbridge as an extension to Jones Avenue on the western side of the rail, crossing over to join with Tycannah Street on the eastern side. A give-way controlled T-junction at Tycannah Street is proposed.

The proposed design passes over Gosport Street and the Moree Bypass, and ramps up from Jones Street just west of Warialda Street. Joyce Avenue will be closed at Jones Avenue as a result of the proposal.

The overbridge is expected to attract local traffic only, with no connectivity between the new bridge and the Moree Bypass. A load limit will be in place to restrict the use of the overbridge by heavy vehicles.

Where the overbridge meets Tycannah Street, the intersection will be at-grade priority controlled T-junction, with the through movements of Tycannah Street having priority.

5. Impact assessment

5.1 Risk assessment

The risk assessment process involved consideration of the consequence and likelihood of the risks associated with each issue identified. The criterion upon which this assessment was based is given in Table 5.1. A consequence and likelihood were selected from Table 5.1 that best represented the likely outcome if the potential hazard actually did occur. For each consequence, the likelihood was considered in terms of the most likely outcome and not the "absolute worst case". Using this information, the risks were then rated using the matrix in Table 5.2 that gave a result in terms of high, significant, moderate or low risk.

Table 5.1 Risk assessment

Consequence		Qualitative measures of consequence or impact	OH&S risk classification
A	Extreme	• Unacceptable impact to the performance of the network. • Intersection performance operates at a Level of Service (LoS) of F. • Total property damage.	• Permanent and severe disablement. • One or more fatalities.
B	Major	• Major impact to the performance of the network. • Intersection performance operates at a Level of Service (LoS) of E. • Major property damage.	• Significant injuries. • Hospitalisation required.
C	Moderate	• Moderate impact to the performance of the network. • Intersection performance operates at a Level of Service (LoS) of D. • Moderate property damage.	• Medical treatment required. • Lost time injury.
D	Minor	• Minor impact to the performance of the network. • Intersection performance operates at a Level of Service (LoS) of C. • Minor property damage.	• Minor medical treatment required. • Not a lost time injury.
E	Not significant	• No impact to the performance of the network. • Affected intersection leg operates at a Level of Service (LoS) of A or B. • No property damage.	• Minor first aid treatment required. • Immediate return to work.

Likelihood	Description
Almost Certain	An event or situation that is happening more or less all the time, including continuous situations.
Likely	An event or situation that occurs or is likely to occur about 10 times or more per year.
Possible	An event or situation that occurs or is likely to occur about once per year.
Unlikely	An event or situation or event that occurs or is likely to occur about once every 10 years.
Rare	An event or situation that occurs or is likely to occur less frequently than once every 10 years.

Table 5.2 Risk rating

Risk Assessment Matrix	Consequence				
Likelihood	Not significant	Minor	Moderate	Major	Extreme
Almost Certain	Medium	Medium	High	Very high	Very high
Likely	Low	Medium	High	High	Very high
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

The identified risks associated with construction and operation are shown in Table 5.3. Analysis of these specific risks is discussed in subsequent sections of this report.

Table 5.3 Risk assessment

Risk	Likelihood	Consequence	Risk Rating
Construction			
Delays on road network: • Due to increased construction traffic.	Unlikely	Minor	Low
Safety: • Crashes between construction traffic and general traffic.	Unlikely	Major	Medium
Operation			
Increased delays at level crossings: • Due to increased train activity.	Possible	Minor	Medium
Queuing from Alice Street level crossing obstructs through traffic and access to the Moree Bypass.	Unlikely	Moderate	Medium
Queuing from Bullus Drive level crossing obstructs through traffic on the Newell Highway.	Unlikely	Moderate	Medium
Queuing from Burrington Road level crossing obstructs through traffic on the Newell Highway.	Rare	Moderate	Low

Risk	Likelihood	Consequence	Risk Rating
Queuing from Tapscott Road level crossing obstructs through traffic on the Newell Highway.	Rare	Moderate	Low
Safety: • Increased potential for crashes between vehicles and trains at level crossings.	Rare	Extreme	High

5.2 How potential impacts have been avoided

Once the proposal is operational, the changes observed by road users would be unlikely to affect their behaviour, or interpretation of a situation. That is, level crossings would continue to operate as normal, with warning devices and other controls installed as per ARTC policy. Interactions between vehicles on the road network would continue to be defined by road rules and the physical configuration of the road, which in most cases will not change from existing conditions.

In most cases all construction activities will be located clear of the existing road network. Any short-term impacts associated with construction vehicle access or works at particular sites will be managed by specific traffic management arrangements put in place by the construction contractor.

5.3 Construction impacts

5.3.1 Access routes

Access to construction sites

Construction site access points would mainly be from public roads or existing access routes which are located within the rail corridor. An access track runs parallel to the rail line along the majority of the alignment.

Potential access routes to each construction site are listed in Table 5.4. Generally, access to construction stage 2 would be from Narrabri, access to construction stage 3 and stage 4 would be from Moree and access to construction stage 1 would be from Moree and North Star. Some sites would have two access points, and some would have alternative routes available, depending on the origin.

Table 5.4 Construction access routes

Chainage (km)	Primary Route	Secondary Route	Tertiary Route
573.000 – 612.150 (multiple sites)	Newell Highway		
612.150 – 616.650	Newell Highway	Millie Road	
616.650 – 639.200 (multiple sites)	Newell Highway	Gurley Creek Road	Access track
639.200 – 643.700	Newell Highway	Gurley Creek Road	Access track
	Newell Highway	Gurley Settlers Road	
643.700 – 652.750 (multiple sites)	Newell Highway	Access track	
652.750 – 661.800 (multiple sites)	Newell Highway	Tapscott Road	
661.800 – 666.500	Newell Highway	Bullus Drive	

Chainage (km)	Primary Route	Secondary Route	Tertiary Route
666.500 – 675.650 (multiple sites)	Newell Highway	Access track	
	Newell Highway	Gwydirfield Road	Access track
675.650 – 681.350	Newell Highway		
681.350 – 685.900	Newell Highway	Mosquito Creek Road	
685.900 – 690.400	Newell Highway	Mosquito Creek Road	Roydon Road
690.400 – 699.400 (multiple sites)	Newell Highway	Mosquito Creek Road	Wongabindie Road
	Newell Highway	Croppa Creek Road	Wongabindie Road
699.400 – 703.900	Gwydir Highway	County Boundary Road	Calimpa Road
	Newell Highway	Croppa Creek Road	Wongabindie Road → Calimpa Road
703.900 – 713.250	Gwydir Highway	County Boundary Road	
713.250 → 717.750	Gwydir Highway	County Boundary Road	Alma Lane
717.750 – 722.250	Gwydir Highway	County Boundary Road	Gil Gil Creek Road
	Newell Highway	Croppa Moree Road → County Boundary Road	Gil Gil Creek Road
722.250 – 731.250 (multiple sites)	Newell Highway	Croppa Moree Road	
	Gwydir Highway	County Boundary Road	Gil Gil Creek Road → Crooble Road → Access Road
731.250 – 740.450 (multiple sites)	Newell Highway	Croppa Moree Road	Buckie Road
	Newell Highway	Buckie Road	
	Newell Highway	Croppa Moree Road	Croppa Creek Road → Access Road
740.450 – 745.000	Newell Highway	Croppa Moree Road	Croppa Creek Road → Tumba Road
	Newell Highway	Buckie Road	Croppa Creek Road → Tumba Road
	Gwydir Highway	County Boundary Road	Croppa Creek Road → Tumba Road
745.000 – 754.250 (multiple sites)	Newell Highway	Croppa Moree Road	Croppa Creek Road → Access Road
	Newell Highway	Buckie Road	Croppa Creek Road → Access Road
	Gwydir Highway	County Boundary Road	Croppa Creek Road → Access Road

Chainage (km)	Primary Route	Secondary Route	Tertiary Route
754.250 – 757.450	Newell Highway	I B Bore Road	Croppa Creek Road
	Newell Highway	I B Bore Road	Croppa Creek Road
	Gwydir Highway	I B Bore Road	Croppa Creek Road
757.450– 760.246	Newell Highway	I B Bore Road	

Access to compounds

Access routes to compounds would be determined based on the following criteria:

- Provision of a suitability wide road to achieve a single lane, two-way access.
- Provision of adequate turning circles for crane and heavy vehicles - at least a 25 metre turning radius capability.
- Minimal property impacts by using access alignments within and adjacent to the rail corridor and existing agreed property access roads as far as practicable.
- Provision of more than one access point where possible to allow access from either road direction.

Haul routes

While a detailed haulage program has not yet been developed, it is expected that some of the proposal's components would be delivered by rail. Other transport would be undertaken by heavy vehicles using the Newell Highway, Gwydir Highway/Alice Street and Kamilaroi Highway and then local roads and existing access roads along the rail corridor.

It is likely that rail components, including sleepers, ballast, and track, would be transported to the work areas via dedicated rail trains; while pre-fabricated concrete units, fill and equipment deliveries would most likely be via road from suppliers or town centres.

5.3.2 Vehicle movements

Timing and staging

An indicative construction program is shown in Figure 5.1. Construction along the existing rail corridor would be undertaken in four stages, subject to agreement with relevant stakeholders. For each stage, rail traffic would be interrupted as described in Table 5.5. The Narrabri to Moree line is used on an average rate of three to four trains per day (both directions), with up to 10 trains on a peak day. Construction of the key features outside the existing rail corridor would be undertaken as follows:

- Newell Highway overbridge – offline construction would be undertaken in parallel with stages 1 to 4 would take about 10 months to complete.
- Offline construction of the Jones Avenue overbridge and the Camurra bypass, would be undertaken in parallel with stages 1 to 4, and would take about six to eight months each to complete.

For the works along the existing rail corridor, it is anticipated that it would take about eight to 10 weeks to construct a 4.5 to five kilometre section of track. This does not include location specific works such as culverts and underbridges or the relocation of services and utilities.

Work Phase	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020
Mobilisation and site establishment									
Stage 1 Construction - Camurra to North Star									
Stage 2 Construction - Narrabri to Bellata									
Stage 3 Construction - Bellata to Moree South									
Stage 4 Construction - Moree South to Camurra									
Signalling									
Testing and Commissioning									
Demobilisation and finishing works/reinstatement									

Figure 5.1 Indicative construction program

Table 5.5 Rail traffic management during construction

Stage	Location	Distance (km)	Rail traffic
1 – Camurra to North Star	Located at the northern end of the proposal site (described in section 2.2) and stopping about 15 km north of the Moree	81	Between Camurra and North Star the existing line is closed, requiring a seven day advanced notice and is only used periodically for seasonal grain trains. Road haulage will replace rail traffic during construction.
2 – Narrabri to Bellata	Located between Narrabri and including the Bellata grain siding at the southern end of the proposal site (described in section 2.2)	52	Roster possession are proposed where grain will be stockpiled during possession or road haulage will replace rail traffic during roster possessions. Passenger rail will be replaced by bus services.
3 – Bellata to Moree South	Located between Bellata and Moree South including the Inverell spur line in the middle of the proposal site (described in section 2.2)	35	Roster possession are proposed where grain will be stockpiled during possession or road haulage will replace rail traffic during roster possessions. Passenger rail will be replaced by bus services.
4 – Moree South to Camurra	Located at Moree and including the Camurra bypass about 10 km north of Moree (described in section 2.2)	20	Roster possession are proposed where grain will be stockpiled during possession or road haulage will replace rail traffic during roster possessions.

Working hours

Construction work would be undertaken during the following hours:

- Monday to Friday: 6:00 am to 6:00 pm
- Saturday: 6:00 am to 6:00 pm
- Sundays and public holidays: 6:00 am to 6:00 pm
- 24 hours during possessions

Workforce

For the majority of the construction period, the workforce would average about 180 people. For some limited items of work an additional short-term workforce may be required.

Workers would travel to the site each day in either one of five 25-seat buses or for local workers their own vehicles. Materials would be delivered to the site by a mixture of small and large trucks. Typical total traffic generation is summarised in Table 5.6.

Table 5.6 Vehicle movements for each stage of construction

Vehicle type		Numbers on site per day	Movements per day	Indicative peak hour movements (one-way)
Light vehicles	Cars and utilities	75	170	75
	Total light vehicles	***75***	***170***	***75***
Heavy vehicles	Light trucks	8	24	8
	25 seater buses	5	10	5
	Haulage and delivery trucks	28	200	28
	Total heavy vehicles	**41**	**234**	**41**

Any movement of oversize or over-mass vehicles will, if required, be subject to specific route planning and road authority approvals. Such movements may be required to utilise the local road network in preference to the Newell Highway and other major roads, in order to minimise traffic impacts. The timing of oversize vehicle movements may also be restricted to minimise impacts.

5.3.3 Traffic impacts

Construction of the proposal would result in temporary impacts to traffic and access within the study area, and an increase in both heavy and light vehicle movements on the local road network. The extent of impacts will depend on the location of the works, and the origin of material and/or workers. A worst-case assessment is detailed below.

Daily traffic generation associated with construction is some 400 vehicle movements, including 234 heavy vehicle movements. The peak hour for traffic generation would occur at the beginning and end of each shift, with up to 116 vehicle movements (one-way), including some 41 heavy vehicles.

The Newell Highway is the busiest of the roads likely to be used for construction access, and as discussed in Section 3.3.1 has a peak hourly volume of approximately 130 vehicles in one direction. An additional 116 vehicles per hour (an 89 per cent increase, noting that trucks have a disproportionate impact compared to light vehicles) would bring the total directional volume to around 250 vehicles per hour. At this volume, the Newell Highway is forecast to operate at Level of Service B or better, as listed in Table 3.4. The anticipated maximum hourly volume on all of the roads expected to be used for access is within the threshold for Level of Service B.

Even if the peak hourly volume were to be increased by around 50%, for example due to seasonal variation, Level of Service B is expected to be achieved.

Proposed works on level crossings may also result in disruptions to local traffic and temporary access restrictions to private property. Where this occurs, alternative access arrangements would be provided and/or appropriate traffic controls implemented. These will be detailed in a Construction Traffic Management Plan prepared by the contractor (see further discussion in Section 6.2.1). The total expected peak hour flows will be within the nominal capacity of the roadway, remaining at Level of Service B or better.

Newell Highway overbridge

The proposed overbridge will be constructed off-line to minimise impacts to traffic during construction. There will be some increase in traffic due to construction vehicles, however the impacts of this will be less than that of other rail works, as discussed above.

Jones Avenue overbridge

There will be some disruption to local traffic on Jones Avenue as the overbridge is constructed. All materials will be imported to site resulting in an increase in heavy vehicle traffic in the area. The construction contractor will be responsible for management of traffic access to the construction site, and for the movement of local traffic, pedestrians and cyclists around the area whilst construction is occurring.

5.3.4 Access and egress

Construction vehicle access to the proposal site would be via the existing road network and access tracks within the rail corridor. These access points must be chosen such that adequate sight distance and a safe access/egress path is available.

Further investigation of access locations is required once detail around the planned construction methodology is known. All construction access points will be designed in accordance with Australian Standards with adequate sight lines to ensure they operate in a safe and efficient manner. In addition, where possible, access will be provided from secondary roads to minimise the potential disruptions to the nearby arterial road network. For the southern sections of the proposal, where the rail line is in close proximity to the Newell Highway, there are limited alternative access routes. For these areas, specific traffic management will be put in place reflecting the prevailing conditions. Where possible, access will be along the rail corridor from a nearby secondary road.

Encroachment of construction works into existing road reserves is not anticipated.

5.3.5 Impacts to train paths

Construction activities will result in temporary impacts on existing rail operations. During each construction stage, rail operations would be altered as outlined in Table 5.5. It is possible that on some parts of the rail network there would be additional train activity, either in terms of train length or frequency. This may increase the frequency of delays at some level crossings. However the maximum length of trains would still be restricted according to ARTC operational restrictions for each line, and therefore the length of delays at crossings are not likely to increase significantly (assuming train speeds are not lower).

5.3.6 Parking impacts

Construction worker parking will be located within the proposal site, and is not expected to have any impact on existing parking supply, including parking for buses where necessary. Based on the worker numbers detailed in Section 5.3.2 parking may be required for up to seven buses per lot. If buses are not used, car parking demand may be up to 120-160 vehicles.

5.3.7 Road network impacts

The greater road network is not expected to be significantly impacted by the construction activities. This is because the roads have sufficient capacity to absorb the increased traffic, and delays or closure at crossings will have localised affect only due to the low volumes on affected roads. During the peak construction activity, Level of Service B or better is expected to be achieved on all affected roads.

Some construction transport will require the use of oversize and over-dimension vehicles. Movement of these vehicles will be subject to route-specific planning, with approvals as required by Roads and Maritime Services and the relevant local council.

5.3.8 Pedestrian and cyclist impacts

Given the generally low volume of pedestrian and cyclist activity through much of the study area, there is not expected to be any significant impacts to pedestrian and cyclists.

During construction within Moree and other areas where there is potential for higher pedestrian volumes, specific pedestrian management measures will be put in place. These will be subject to site specific planning, and reflect the nature of the works underway and the impacts on the existing pedestrian and cycle network.

5.3.9 Public transport impacts

There will be impacts to the passenger train services while works are underway between Narrabri and Moree, with passenger train movements suspended during track possessions.

Coach services would replace trains when rail closures are in place. Management of this process would be subject to specific planning depending on the section of track that is closed, but would be similar to arrangements put in place for track work at other times.

An existing passenger service train (the Northern Tablelands Xplorer) travels between Sydney and Moree, and stops at Bellata and Moree stations within the proposal site. During construction at Bellata and Moree, buses would be used in place of trains to transport passengers to the nearest active station. The location of the bus stops would take into consideration the safe access of passengers, and proximity to the construction impact zone. The train patronage levels using these stations are low, and therefore delays incurred due to the works are expected to be minimal. Works would be staged where possible to further minimise impacts to passengers.

5.4 Operation impacts

5.4.1 Existing and forecast travel demands

Road

During operation, there will be some maintenance/operational traffic generated, however this is not expected to be significantly higher than existing. Also, there is not expected to be an increase in traffic to the train stations within the study area as no change is proposed to passenger train services. Therefore, there is expected to be minimal traffic generation as a result of this proposal.

Travel times along the Newell Highway are expected to be maintained at existing levels, with no impact as a result of the operation of the proposal.

For roads which cross the rail line at a level crossing, an increase in delay could be expected, as discussed in Section 5.4.2.

Rail

The operations will recommence in 2020 after construction. Inland Rail as a whole would be operational once all 13 sections are complete, which is estimated to be in 2025. It is estimated that the operation of Inland Rail would involve an annual average of about 10 trains per day travelling north of Moree (between North Star and Moree) and 12 trains per day travelling south of Moree (between Moree and Narrabri) in 2025. This would increase to about 19 trains per day north of Moree (between North Star and Moree) and 21 trains per day south of Moree (between Moree and Narrabri) in 2040. This traffic would be in addition to the existing rail traffic using the Narrabri to North Star line.

5.4.2 Level crossings

The key traffic impact of the proposal will be impacts on travel time as a result of increased train activity at level crossings. The duration of delays will in some cases be reduced due to increased train speeds that will be possible.

Table 5.7 and Table 5.8 show the outputs of a model of existing and forecast delays for the level crossings at Alice Street and Bullus Drive respectively. These are the busiest level crossings in Moree with active warning systems.

Table 5.7 Alice Street delays per train

	Maximum delay at crossing (sec)	95% Number of vehicles delayed (two-way)	95% Cumulative delay to all vehicles (minutes)
Existing	143	22	28
2040 with 1,800 m maximum length	143	27	33

The delays detailed in Table 5.7 are based on a train speed of 70 km/hr, with a 45 second pre-train warning period, along with a 5 seconds after the train has passed, where road traffic is prohibited from proceeding. These values are longer than the absolute minimum producing a conservative assessment of potential level crossing delays. AM peak hour volumes were considered, based on data provided by Moree Plains Shire Council, and traffic growth of 1% per annum.

Table 5.8 Bullus Drive delays per train

	Maximum delay at crossing (sec)	95% Number of vehicles delayed (two-way)	95% Cumulative delay to all vehicles (minutes)
Existing with 1,800 m maximum length	143	13	17
2040 with 1,800 m maximum length	143	15	19

The delays detailed in Table 5.8 are based on a train speed of 70 km/hr. A 45 second pre-train warning has been assumed, along with a 5 seconds after the train has passed, where road traffic is prohibited from proceeding. The peak hour is assumed to be 8% of the AADT, based on data for Alice Street.

Greater impacts are seen at Alice Street due to the higher traffic volumes.

The impact of these changes, assessed in relation to the traffic volumes and nearby intersections, are included in Section 5.4.3.

5.4.3 Traffic and intersection impacts

As discussed in Section 5.4.1, there is expected to be minimal increase in traffic on the road network as a result of the proposal.

The increased delay at level crossings will impact on the performance of some intersections due to increased queuing. This is discussed for three intersections in Moree with the highest traffic volumes.

Alice Street/Moree Bypass

As detailed in Section 3.4.1, the peak hour operation of this intersection without the impact of a train arrival has been modelled as Level of Service C using SIDRA Intersection 6.1. An assessment of intersection operation with a train arriving during the peak hour was also undertaken. Level of Service is reduced to LOS E in both peak hours. Note that this is based on average delays over the peak hour, so while substantial delays may be experienced while a train is crossing the road, this occurs for only a small proportion of the peak hour, so average delays are contained. For this reason, should a second train arrive during the same hour, there is not a significant worsening in Level of Service. The time between trains allows traffic conditions to recover towards “normal” conditions.

Bullus Drive/Newell Highway

At the Bullus Drive level crossing, the maximum queue length was modelled from the 95th percentile number of vehicles delayed, assuming 70 per cent of peak hour traffic is heading eastbound when a train arrives (this traffic pattern might be expected during a weekday morning peak hour) (Table 5.9). A queue length of seven metres per light vehicle and 25 metres per truck has been assumed, with 10 per cent trucks.

Table 5.9 Bullus Drive/Newell Highway delays

	95% Number of vehicles delayed (eastbound only)	Queue length (metres)
Existing with 1,800 m maximum length	13	80
2040 with 1,800 m maximum length	15	92

The length of Bullus Drive between the level crossing and the intersection of the highway is approximately 55 metres. Therefore, in this worst-case scenario of a train arriving during the morning peak hour, there would be queuing of vehicles onto the highway. The majority of vehicles turning into Bullus Drive would be coming from Moree, and could queue within the left turn lane if necessary without impacting through traffic on the highway. A right turn lane is also provided that serves the same purpose.

If a train obstructs the level crossing during the peak hour then operation of the Newell Highway/Bullus Drive intersection has been modelled as remaining at Level of Service A (refer to Section 3.4.2). This level of service is calculated as an average over the hour, although additional delays could be experienced by traffic seeking to turn off the Newell Highway due to queued traffic obstructing progress along Bullus Drive. Assuming delayed vehicles utilise the queuing areas provided and do not obstruct the through traffic lanes, Newell Highway traffic should not be delayed.

Burrington Road/Newell Highway

Given the very low traffic volumes on Burrington Road, the additional delays at the level crossing will have minimal impact, and any queuing at the crossing is not expected to impact the intersection with Newell Highway.

For an AADT of 300, a peak hour volume of around 30 vehicles is expected. This is an average of one vehicle every 2 minutes and therefore a delay of up to 4 minutes (for a long train) is likely to only delay two to three vehicles.

Newell Highway overbridge

The proposed overbridge will be constructed to a higher standard than the existing and is compliant with Roads and Maritime Services' design criteria contained within its Newell Highway Corridor Strategy, and with the relevant Austroads design standards.

For most road users it will be essentially identical from an operational perspective to the existing overbridge.

Jones Avenue overbridge

The primary traffic impacts of the overbridge will be on Jones Avenue and Tycannah Street, where increases in traffic volumes are expected as vehicles divert from Alice Street and Bullus Drive. It is noted that the overbridge will be restricted to light vehicles only (emergency services and public transport may be exceptions) and therefore no increase in heavy vehicle traffic is expected on these streets.

The overbridge will be designed in accordance with relevant Austroads guides, including Roads and Maritime Services supplements.

Table 5.10 shows the predicted daily traffic volumes on various streets surrounding the Jones Avenue overbridge for current conditions, 2020 (predicted year of opening) and 10 years after opening.

Table 5.10 Daily traffic volumes

	Base			With overbridge		Change from Base (%)
	2016	2020	2030	2020	2030	
Alice Street east of Bypass	4863	5057	5543	4340	4757	-14%
Alice Street west of Bypass	5158	5364	5880	4647	5093	-13%
Jones Avenue overbridge				1147	1258	

	Base			With overbridge		Change from Base (%)
	2016	2020	2030	2020	2030	
Jones Avenue east of old Newell Highway	303	315	345	1463	1603	+364%
Jones Avenue west of old Newell Highway	2718	2827	3099	3056	3350	+8%
Bullus Drive	2824	2937	3219	2507	2748	-15%
Tycannah Street south of overbridge	1791	1863	2042	2292	2513	+23%
Tycannah Street north of overbridge	1791	1863	2042	2580	2828	+39%

The process used to estimate these volumes is described below:

- Consider existing volumes at Alice Street and Bullus Drive, and exclude all heavy vehicles from being considered as candidates to cross via Jones Avenue.
- Exclude those vehicles which turn right from Alice Street onto the Newell Highway (Moree Bypass north), and vice-versa, as it is assumed that these will always use Alice Street. This accounts for five to six per cent of total daily traffic on Alice Street.
- Similarly exclude those vehicles which turn left from Bullus Drive onto the highway, and northbound right turns into Bullus Drive. This is 7-11 per cent of total daily traffic on Bullus Drive.
- It is assumed that 15 per cent of remaining traffic at Alice Street would divert to Jones Avenue.
- Similarly, 20 per cent of remaining traffic at Bullus Drive would divert to Jones Avenue (the proportion is slightly higher to reflect the more direct route that is now created).

The Roads and Maritime Services Guide to Traffic Generating Developments (2002) provides environmental capacity performance standards on residential streets, which considers the impact of traffic volumes on the amenity of residents. This is shown in Table 5.11.

Table 5.11 Environmental capacity performance standards on residential streets

Road Class	Road Type	Maximum Speed (km/hr)	Maximum peak hour volume (veh/hr)
Local	Access way	25	100
	Street	40	200 environmental goal
			300 maximum
Collector	Street	50	300 environmental goal
			500 maximum

The greatest increase in traffic is seen on Jones Avenue east of the old Newell Highway (Frome Street) where there are currently very low volumes of around 300 vehicles per day, increasing to around 1500 vehicles per day with the overbridge. It is expected that there will be approximately 120-150 vehicles in the peak hour. This volume is well within the capacity of the road and within the environmental goal for a local or collector street according to the Roads and Maritime Services Guide.

Tycannah Street volumes are expected to increase to around 2800 vehicles per day by 2030. The peak hour volume is expected to be around 225-280 vehicles per hour. This is within the environmental goal for a collector street.

Modifications may be required at the connection of Joyce Avenue with Jones Avenue, requiring traffic to use Frome Street to access Joyce Avenue. Joyce Avenue is a short (300 metre) street and any changes will have only minor impact on some travel distances and times. No significant change in performance is expected at the Frome Street intersection as a result of the modification.

The Jones Avenue overbridge will have benefits for all road users by improving connectivity across the rail line. This is particularly important for emergency vehicles as it will remove the risk of being delayed at a level crossing and would be critical in the event of a train breakdown within Moree.

The Jones Avenue overbridge will include facilities for pedestrians and cyclists and provide improved connectivity and safety by providing a grade separated option for crossing the rail line.

5.4.4 Access and egress

During operation, minimal impacts are anticipated as access to the rail line would be via existing corridor access points. These access points must be chosen such that adequate sight distance and a safe access/egress path is available, and be built in accordance with Austroads design standards.

5.4.5 Impacts to train paths

The upgrades will not have any negative impacts to train paths when in operation.

Proposed freight train speeds would vary according to axle loads, and range from 80 kilometres per hour (30 tonne) to 115 kilometres per hour (21 tonne). This is an improvement on existing train speeds that are limited to a maximum of 90 to 100 kilometres per hour (80 kilometres per hour between Moree and North Star), and with local speed restrictions due to existing track condition.

5.4.6 Parking impacts

The proposal does not require removal of any existing parking provision, and is expected to generate minimal demand for parking around train stations given that no change is forecast to passenger train services. Therefore, no impacts to parking are expected as a result of the proposal.

5.4.7 Road network impacts

As discussed in Section 5.4.1, there is expected to be minimal increase in traffic on the road network as a result of the proposal. The increased delay at intersections and level crossings is expected to have a localised impact only. In particular, through movements on the Newell Highway are not likely to be affected.

Overall, the proposal is expected to have a positive impact on the road network by relocating some of the road freight task to rail, thereby reducing the heavy vehicle freight traffic on the roads both within the study area and in the greater NSW network.

5.4.8 Pedestrian and cyclist impacts

There will be little impact to pedestrians and cyclists given the generally low volumes within most of the proposal area. Pedestrians and cyclists using the Alice Street and Moree Station pedestrian crossings may experience some additional delay as a result of increased frequency and length of trains. The Jones Avenue overbridge will improve pedestrian and cyclist accessibility, by providing an additional crossing of the rail line that will not be disrupted by train movements.

5.4.9 Public transport impacts

There will be no negative impacts to passenger train services as a result of the proposal. Bus services which cross the rail line may experience a small increase in delays at level crossings due to the increased rail use, in line with other road users on these roads.

The Jones Avenue overbridge provides an opportunity for a new local bus connection across the rail line, subject to further investigation.

5.5 Cumulative impacts

The assessment detailed above has taken into account growth in traffic volumes into the future. There are no further anticipated developments that would impact on the proposal.

6. Mitigation and management

6.1 Options for impact mitigation

The options for reducing the potential for increased delays to road traffic as a result of the proposal include:

- Maintaining current maximum train lengths:
  - With no change in train speeds the duration of delays at level crossings would be similar to existing
  - With improved train speeds the duration of delays would be less than existing
  - However, increased train lengths will provide the freight efficiency that is one of the objectives of the proposal
- Grade separation of the rail line at road crossings:
  - Delays to road vehicles would be removed entirely, and the safety risks associated with train/vehicle conflict avoided
  - This will require a significant variation to the proposal, and would have additional impacts in terms of construction footprint, costs and environmental issues
  - Due to the small volume of vehicles that cross the rail line, grade separation is not likely to be feasible at most level crossing locations

During construction, options for impact mitigation will depend on the specific activity being undertaken, and the location where it is occurring. It will be up to the construction contractor to select and implement appropriate controls.

6.2 Summary of measures

6.2.1 During construction

It is recommended that a Construction Traffic Management Plan be developed that will guide the interaction of construction activities with the public road network. It should cover such aspects as:

- Access routes
- Driver behaviour/codes of conduct
- Traffic control procedures
  - Development and implementation of traffic control plans
  - Temporary speed limit requirements
  - Temporary road closures and detours
- Construction site access
  - Upgrades to be designed in accordance with Austroads Guide to Road Design and Roads and Maritime Services Supplements, and local council requirements where appropriate
- Road pavement condition
- Worker car parking

- Movement of oversize vehicles (if required)
- Management of public transport impacts (including school buses)
- Management of pedestrian and cyclist impacts

The Construction Traffic Management Plan should be developed in consultation with Narrabri Shire Council, Moree Plains Shire Council, Gwydir Shire Council and Roads and Maritime Services, and be subject to periodic review and update as agreed between the stakeholders.

6.2.2 During operation

It is not considered feasible to avoid any increase in potential delays to road users at level crossings as a result of the proposal. However, it is recommended that measures be put in place to manage any localised safety implications that may occur, due to increase queueing. These will include:

- Provision of all necessary and appropriate warning signage, line marking and other traffic controls at level crossings, in accordance with ARTC and Australian Standards. It is critical that controls at level crossings be consistently applied throughout the proposal.
- Review of traffic behaviour at level crossings once the proposed works are complete, to confirm that the available infrastructure is appropriate for the prevailing traffic conditions.

7. Conclusion

The proposed Narrabri to North Star section of Inland Rail will ultimately allow for faster and more frequent freight train services. The proposal is largely remote from the existing road network, except at level crossings. The majority of level crossings are of minor roads, including private access ways.

The proposal will have different impacts during construction and during operation.

During construction, the main traffic and transport impacts will be related to the movement of construction vehicles to and from the various construction sites along the proposal area. Depending on the construction methodology adopted, there may be up to 400 vehicle movements per day, with a peak one-way volume of 116 vehicles per hour. These movements will be spread across the day, so while the additional traffic will be noticeable, an adequate Level of Service is maintained. Access to construction sites and compounds will be subject to specific planning and traffic management arrangements. Accesses will be constructed in accordance with Austroads standards, and other requirements that may be set down by Roads and Maritime Services and/or Council. Access via the local road network is preferred over direct access from an arterial road, where this is possible.

It is recommended that a Construction Traffic Management Plan be produced to guide the interaction of construction activities with the public road network. The plan should be prepared in consultation with the Narrabri Shire Council, Moree Plains Shire Council, Gwydir Shire Council and Roads and Maritime Services, and be subject to periodic review and update as agreed between the stakeholders.

Once the proposal is operational, minimal traffic generating activity is anticipated. The primary traffic impacts relate to changes in delays at level crossings. The proposal will allow faster train speeds which will reduce level crossing delays slightly, however the frequency or likelihood of delays would increase commensurate with the increased number of trains per day. Traffic activity at most level crossings in the proposal area is low, and the volume of traffic likely to be delayed by train activity is not substantial. Within Moree, the Newell Highway and Moree Bypass runs adjacent to the rail line and there are two key intersections which will be affected by increased train activity at level crossings, being Alice Street and Bullus Drive.

At the signalised Alice Street/Moree Bypass intersection the level crossing is incorporated into the traffic signals. While a train passes there may be substantial delays experienced for affected traffic, however the signals return to normal function between trains. At the Bullus Drive/Newell Highway intersection, a passing train during the morning peak hour may cause traffic to queue onto the highway, however long turn lanes allow storage for these vehicles to avoid impact to through traffic on the highway.

8. References

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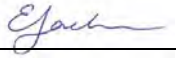
0	T. Bickerstaff	E. Jackson		S. Page		17/10/17

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